(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
5 June 2003 (05.06.2003)

PCT

(10) International Publication Number
WO 03/045200 A2

(51) International Patent Classification[7]: A47G

(21) International Application Number: PCT/US02/37997

(22) International Filing Date:
27 November 2002 (27.11.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/333,564 27 November 2001 (27.11.2001) US
Not furnished 22 November 2002 (22.11.2002) US

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(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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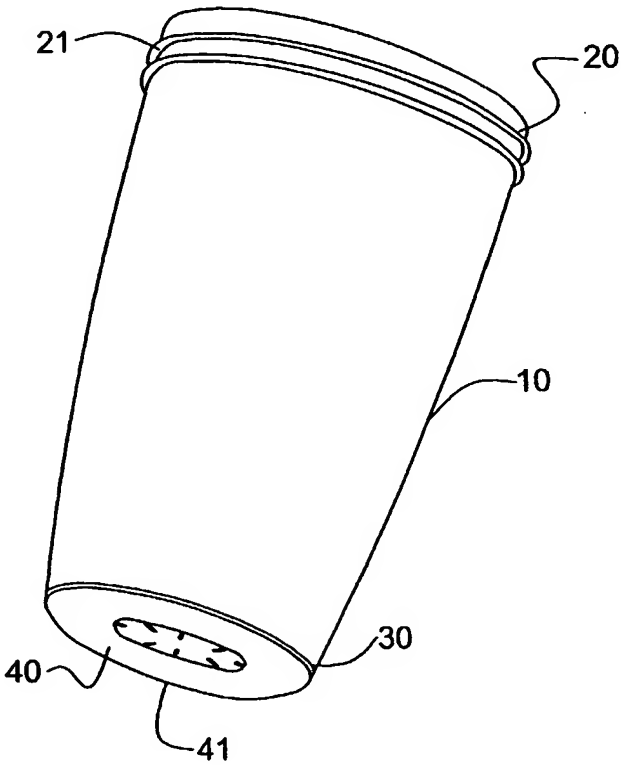
(54) Title: SPILL-PROOF CUP ASSEMBLY WITH VENTED BOTTOM



(57) Abstract: There is provided a spill proof cup assembly having a cap with at least one spout outlet, a cup with an upper open poriton adapted to securely and sealing receive the cap, and a thermoplastic elastomer, or similar elastomeric material, co-molded bottom portion with a vent disposed therein for allowing air to enter the cup as fluid exits through the spout outlet. The result is a one-way flow of air.

WO 03/045200 A2

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

SPILL-PROOF CUP ASSEMBLY WITH VENTED BOTTOM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a spill proof cup assembly for holding and dispensing drinkable fluids. More particularly, the present invention relates to a spill proof cup assembly having a thermoplastic elastomer (TPE) co-molded bottom with a vent or vent mechanism disposed therein to dissipate the vacuum created as fluid is withdrawn from the cup.

2. Description of the Related Art

Spill proof cups having caps with a fluid outlet spout and an air inlet vent to permit drinking from the cup without creating an excessive vacuum in the cup, are well known. Further, many of these cups have valving mechanisms, typically coupled with the cap, via the spout and/or the air vent, that respond to the suction generated during drinking to allow fluid to exit the spout and allow air to enter the vent as a vacuum develops in the interior of the cup.

Despite the effectiveness of these different cup/cap mechanisms, the applicant has discovered a unique venting mechanism for venting a cup without having a vent located at an upper portion of a cup, without sacrificing the cup's resistance to spills/leaks, and requiring fewer parts. In addition, the present invention may also allow the cup to be formed of more brittle cup materials.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved spill proof

cup assembly that is substantially leak-proof.

It is another object of the present invention to provide such a spill proof cup assembly having a thermoplastic elastomer (TPE) co-molded bottom with a vent disposed therein.

It is still another object of the present invention to provide such a spill proof cup assembly that allows air to flow through the bottom of the cup via the vent to replace the volume of fluid as the fluid is removed.

It a further object of the present invention to provide a method of manufacture for a spill proof cup assembly having a TPE bottom with a vent disposed therein.

It is yet still a further object of the invention to provide a cup assembly having a soft, cushioned bottom portion for reducing the likelihood of cup breakage, resulting from dropping, and thereby allowing the cup assembly to be comprised of a wider range of materials, including more brittle materials.

These and other objects and advantages of the present invention are achieved by a spill proof cup assembly having a cup with an upper open portion and a bottom portion. The bottom portion has a vent disposed therein. The assembly preferably has a cap, with at least one fluid outlet, and adapted to enclose the upper open portion.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a cup assembly in accordance with the present invention;

Fig. 2 is a side view of the cup assembly of Fig. 1;

Fig. 3 is a side section view of the cup assembly of Fig. 1, highlighting the cup and co-molded TPE bottom;

Fig. 4 is an enlarged view of the cup assembly of Fig. 3, highlighting not

only the cup component and co-molded TPE bottom but also, vents disposed therein;

Fig. 5 is a bottom view of the cup assembly of Fig. 1, showing the polypropylene injection molded cup component before it is co-molded with TPE;

Fig. 6 is an interior bottom view of the cup assembly of Fig. 5;

Fig. 7 is a bottom view of the cup assembly of Fig. 1, showing the polypropylene injection molded cup component after it is co-molded with TPE; and

Fig. 8 is an interior bottom view of the cup assembly of Fig. 7.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings and in particular Figs. 1 through 3, there is shown a spill proof cup assembly in accordance with a preferred embodiment of the present invention generally represented by reference numeral 1. Cup assembly 1 preferably has a cup or hollow body 10 with an upper end 20 and a lower end 30, and a flexible membrane 40 co-molded with lower end 30. Preferably, hollow body 10 and flexible membrane 40 are made of at least two distinct materials. These distinct materials preferably are polypropylene and thermoplastic elastomer (TPE), respectively. However, other materials such as for example high density polyethylene, polycarbonate, urethane rubber, and silicone may also be used. Further, hollow body 10 can be made of a more clarified, attractive brittle material.

Hollow body 10 preferably has an elongated central vertical axis **A** with an upper end 20 forming an upper opening 22 and a lower end 30 forming a lower opening 32 shown clearly in Figs. 5 and 6. Preferably, upper end 20 selectively cooperates with a cap 24. Cap 24 preferably having at least one spout or fluid dispensing outlet 26. Upper end 20 preferably also has threads 21 for engaging corresponding threads 23 of cap 24. It should be noted,

however, that upper end 20 may also be configured without threads such that cap 24 is snap fit over upper end 20. Preferably, lower end 30, as shown in Figs. 3, 4, 5 and 6, has an inner flange 34 preferably running along a lower inner edge 36 of hollow body 10. Inner flange 34 preferably having one or more apertures serving as mechanical locks 38 when flexible membrane 40 is co-molded to hollow body 10.

Referring generally to Figs. 1 through 8, preferably mechanical locks 38 are arranged such that when flexible membrane 40 is co-molded with hollow body 10, lower opening 32 is preferably filled with the elastomeric material or TPE and inner flange 34 is preferably sandwiched between two layers of TPE, an upper layer 42 and a lower layer 44. The result is a flexible membrane defining a vent area 46 that is actuated by differences in pressure. Preferably, mechanical locks 38 are small apertures advantageously situated in inner flange 34 allowing upper layer 42 and lower layer 44 to be connected through the inner flange.

Flexible membrane 40, preferably is soft and provides a cushioning protection for reducing the likelihood of the cup assembly being broken dropped or mishandled. Thus, the co-molding of flexible membrane 40 onto hollow body 10 preferably allows the hollow body to be formed from a more brittle material, which ordinarily would not be usable because of its more fragile nature. Vent area 46, preferably has one or more dimples or vents 48. Vents 48 preferably are molded into shape and pierced via a secondary operation. The result is a dimple/pierce that behaves as a pressure actuated valve for allowing air to enter the cup while preventing fluid from leaking out. Vents 48 are preferably positioned as shown in Figs. 7 and 8, with the dimple side facing outwardly from lower end 30. This configuration is important, as there are mechanical advantages that can be leveraged therefrom. For example, as fluid pushes down on vents 48, the pressure preferably causes the adjacent surfaces of

upper layer 42 and lower layer 44, which are fashioned by the secondary piercing operation, to be pressed against each other causing vents 48 to close. Conversely, when there is a vacuum within the cup and pressure builds on the outer side of vents 48, the adjacent surfaces of upper layer 42 and lower layer 44 separate causing vents 48 to open. Thus, the configuration shown in Figs. 7 and 8, preferably facilitates lower end 30 being in compression with vents 48 closed, when there is a positive pressure in the cup, and in tension with vents 48 open, when there is a negative pressure in the cup. This provides the functional performance desired (i.e. a one way flow).

Cup assembly 1 is preferably configured to allow air to enter hollow body 10 through lower end 30 via vents 48 to replace fluid being removed from the cup via outlet spout 26 of cap 24. This helps reduce the vacuum that tends to develop within hollow body 10 as fluid exits during drinking.

Cup assembly 1 is preferably formed by injection molding hollow body 10 such that upper end 20 is open and lower end 30 is open with inner flange 34 reducing the cross-sectional area of the lower end opening to be less than that of the upper end opening. Once hollow body 10 is formed, flexible membrane 40 is preferably co-molded to lower end 30 such that the flexible membrane enfolds inner flange 34 and fills lower opening 32 to define vent area 46.

The present invention having been thus described with particular reference to the preferred forms thereof, it will be obvious that various changes and modifications may be made therein without departing from the spirit and scope of the present invention as defined herein.

WHAT IS CLAIMED IS:

1. A cup assembly comprising:

a hollow body having an upper end and a lower end; and

a flexible membrane co-molded with said lower end of said hollow body for form a vent area.

2. The cup assembly of claim 1, wherein said upper end of said hollow body forms an upper opening for selectively cooperating with a cap (need to include cap in drawings).

3. The cup assembly of claim 2, wherein said cap has a fluid dispensing outlet.

4. The cup assembly of claim 1, wherein said lower end of said hollow body forms a lower opening having an inner flange.

5. The cup assembly of claim 4, wherein said inner flange has one or more mechanical locks.

6. The cup assembly of claim 5, wherein said one or more mechanical locks facilitate said co-molding of said flexible membrane to said

lower end of said hollow body.

7. The cup assembly of claim 6, wherein said flexible membrane enfolds said inner flange and fills said lower opening to define said vent area.

8. The cup assembly of claim 7, wherein said vent area has one or more vents.

9. The cup assembly of claim 8, wherein said one or more vents function as pressure actuated valves.

10. The cup assembly of claim 9, wherein said one or more vents allow air to flow through said lower opening into said hollow body while preventing a fluid, when contained in said hollow body, from flowing through said lower opening out of said hollow body.

11. The cup assembly of claim 12, wherein said one or more vents dissipate a vacuum created as said fluid is withdrawn from said hollow body via said cap fluid dispensing outlet.

12. A cup assembly comprising:

a hollow body having an upper end and a lower end; and

a flexible membrane co-molded with said lower end of said hollow body and having one or more pressure actuated vents disposed therein.

13. The cup assembly of claim 12, wherein said hollow body is formed from polypropylene and said flexible membrane is formed from a thermoplastic elastomer (TPE).

14. The cup assembly of claim 12, wherein said hollow body is formed from a clarified, attractive material having more brittle characteristics.

15. The cup assembly of claim 12, wherein said flexible membrane is formed from any one and/or combination of the following materials: a polyethylene, a polycarbonate, a urethane rubber, or a silicone.

16. The cup assembly of claim 13, wherein said upper end has an upper opening and cooperates with a cap having a fluid dispensing outlet.

17. The cup assembly of claim 16, wherein said lower end of said hollow body forms a lower opening with an inner flange having one or more mechanical locks facilitating said co-molding of said flexible membrane to said lower end of said hollow body.

18. The cup assembly of claim 19, wherein said flexible membrane enfolds said inner flange and fills said lower opening such that said one or more pressure actuated vents form a vent area for allowing air to flow through said lower opening into said hollow body while preventing a fluid contained in said hollow body from flowing through said lower opening out of said hollow body, thereby dissipating any vacuum created as said fluid is withdrawn from said hollow body via said cap fluid dispensing outlet.

19. A method of manufacturing a cup, comprising the steps of:

injection molding a hollow body having an open upper end and a lower end with an inner flange;

co-molding a flexible membrane with said lower end of said hollow body such that said flexible membrane enfolds said inner flange and fills said lower opening to define a vent area.

20. The method of manufacturing a cup of claim 19, wherein said inner flange has one or more mechanical locks for facilitating said co-molding process.

21. The method of manufacturing a cup of claim 19, wherein said vent area has one or more pressure actuated vents for allowing air to flow through said lower opening into said hollow body while preventing a fluid contained in said hollow body from flowing through said lower opening out of said hollow body, thereby dissipating any vacuum created as said fluid is withdrawn from said hollow body via said cap fluid dispensing outlet.

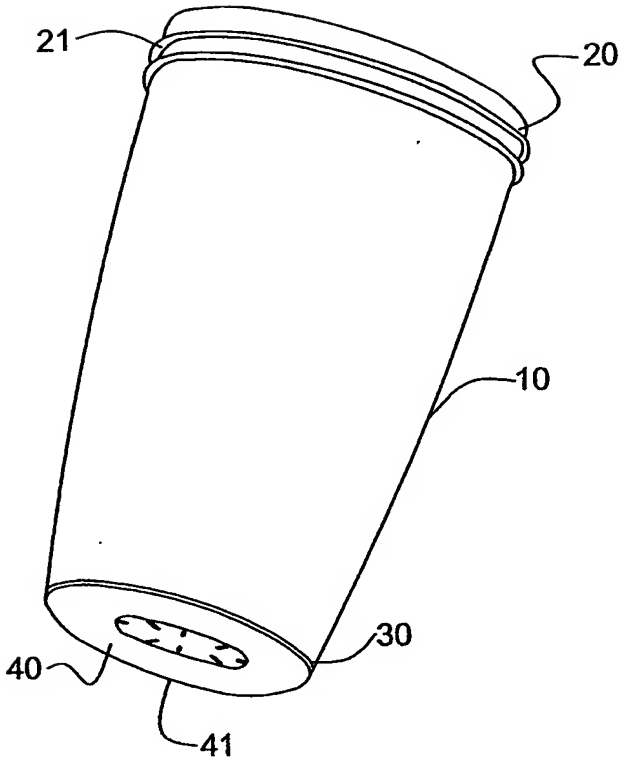


Fig. 1

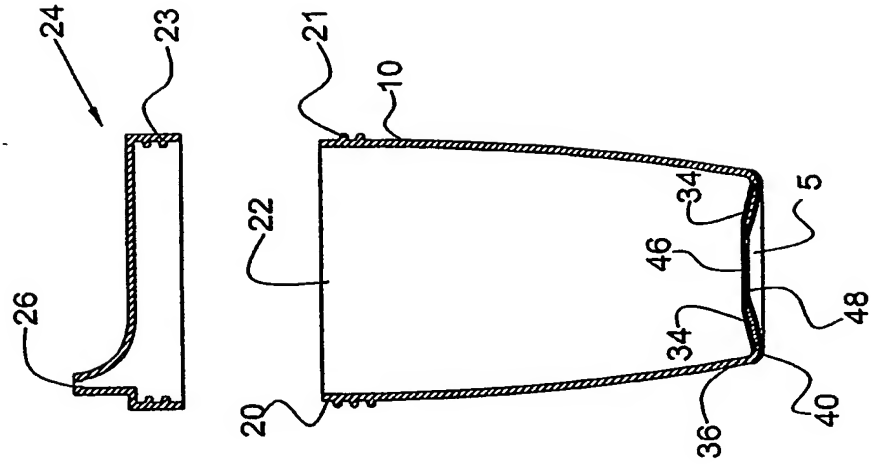


Fig. 3

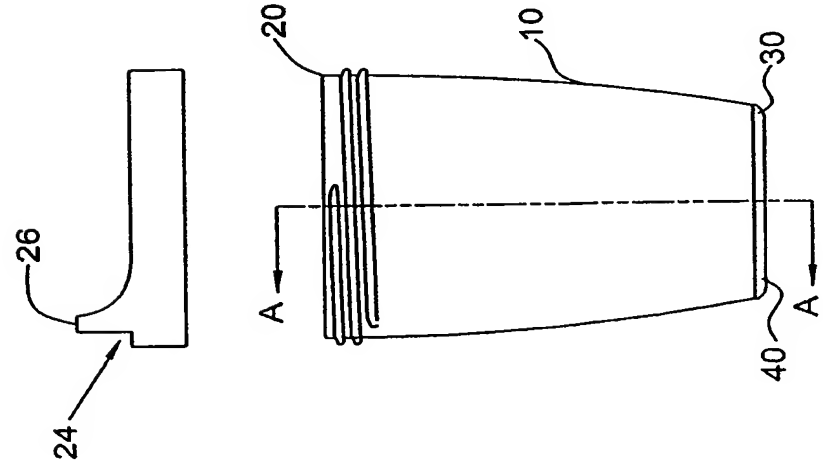


Fig. 2

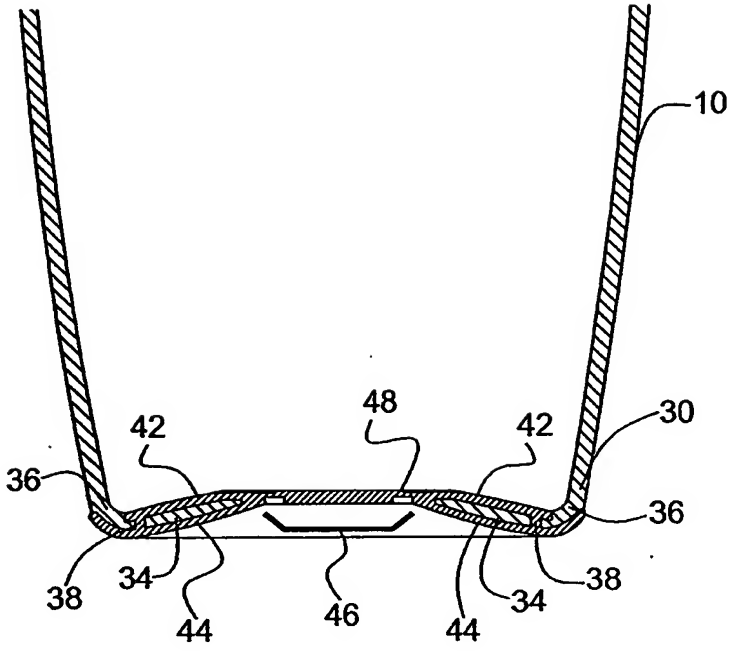


Fig. 4

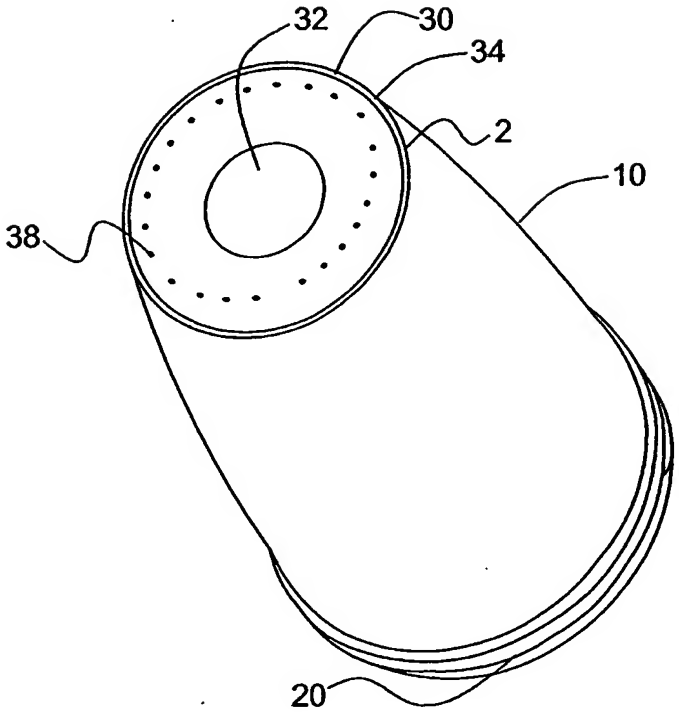


Fig. 5

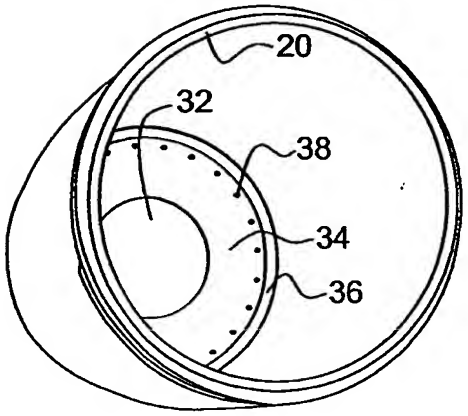


Fig. 6

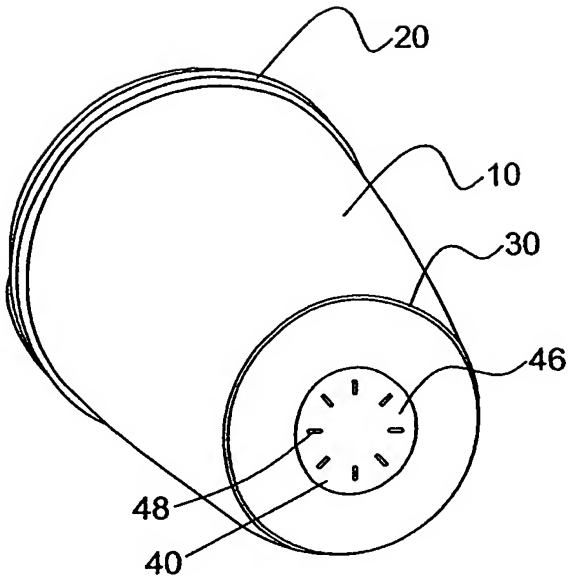


Fig. 7

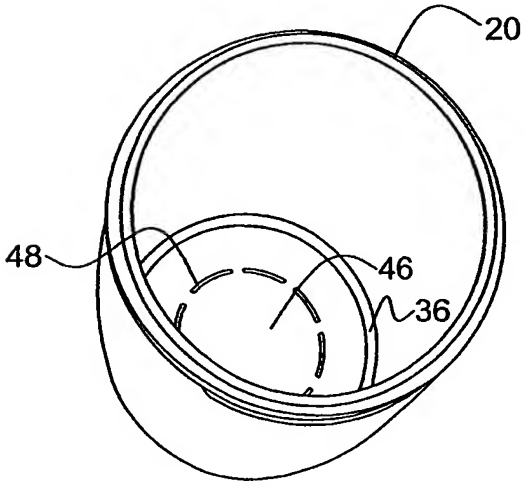


Fig. 8